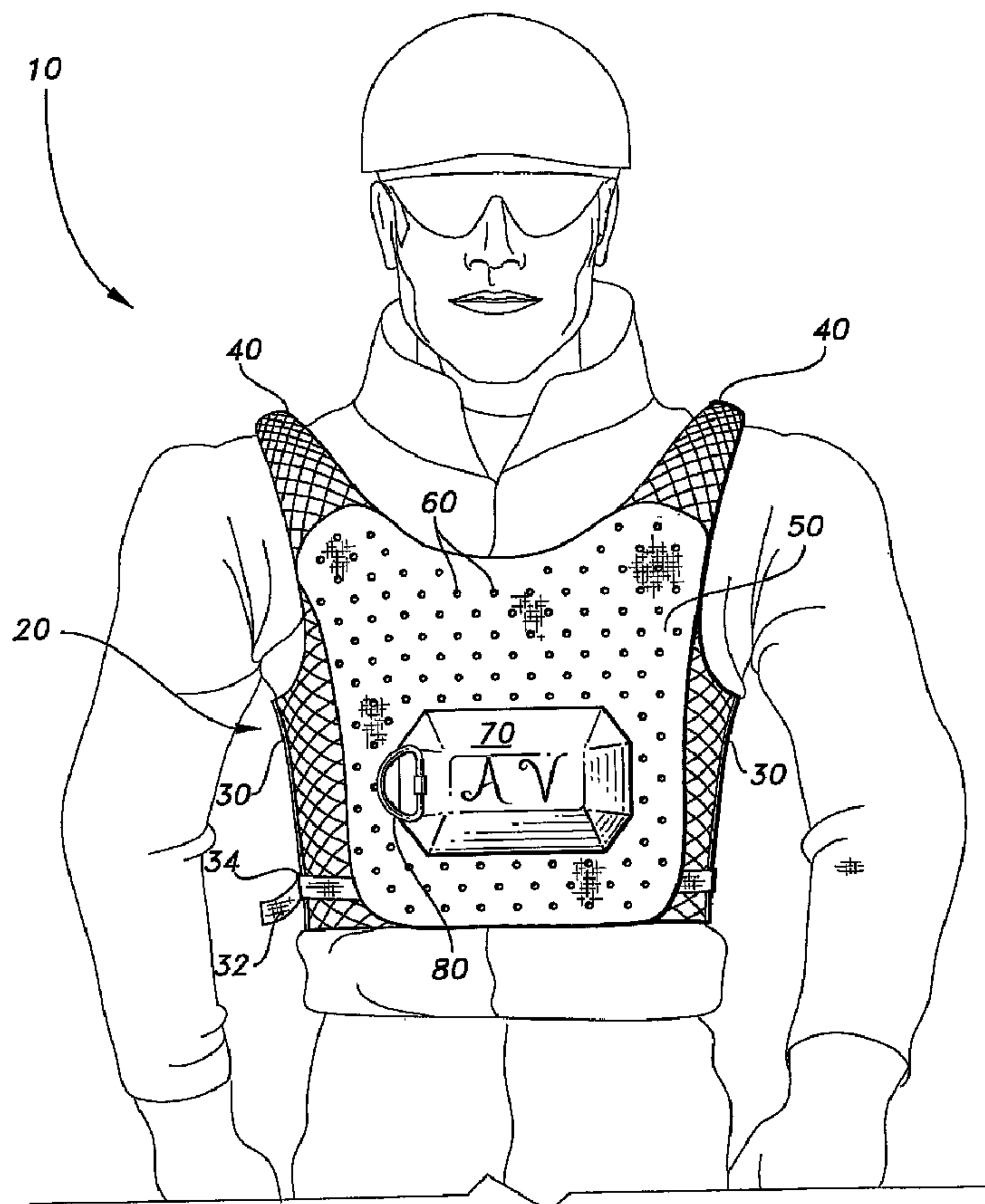




(86) Date de dépôt PCT/PCT Filing Date: 2004/06/04
(87) Date publication PCT/PCT Publication Date: 2004/12/16
(45) Date de délivrance/Issue Date: 2010/05/04
(85) Entrée phase nationale/National Entry: 2005/12/02
(86) N° demande PCT/PCT Application No.: CA 2004/000819
(87) N° publication PCT/PCT Publication No.: 2004/107888
(30) Priorité/Priority: 2003/06/05 (US60/475,910)

(51) Cl.Int./Int.Cl. *A41D 13/018* (2006.01),
A63B 29/02 (2006.01)
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(54) Titre : GILET MUNI D'UN COUSSIN GONFLABLE
(54) Title: VEST WITH AIR BAG



(57) Abrégé/Abstract:

A vest with air bag (20) includes a shell with shoulder pads (40), a front chest protector (50) having ventilation holes therethrough attached to the shell and an air bag (100) attached to the chest protector. The shell defines a neck opening, a torso opening, and a



(57) Abrégé(suite)/Abstract(continued):

pair of opposed arm holes. The air bag (100) is configured to expand in front of a torso of a user. The vest includes a cartridge/canister (222), an activator (224), and a pull ring (80). The vest may include a power source (212), a sensor (214), a die marker (216), a positioning device (226), a communication device (228), an antenna (230), a control logic (210), and a communication bus (232). The pull ring (80) is configured to operatively engage the activator (224) to release breathable gas from the cartridge/canister (222) when the pull ring is pulled by a user.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
16 December 2004 (16.12.2004)

PCT

(10) International Publication Number
WO 2004/107888 A1

(51) International Patent Classification⁷: A41D 13/018,
A63B 29/02

(21) International Application Number:
PCT/CA2004/000819

(22) International Filing Date: 4 June 2004 (04.06.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/475,910 5 June 2003 (05.06.2003) US

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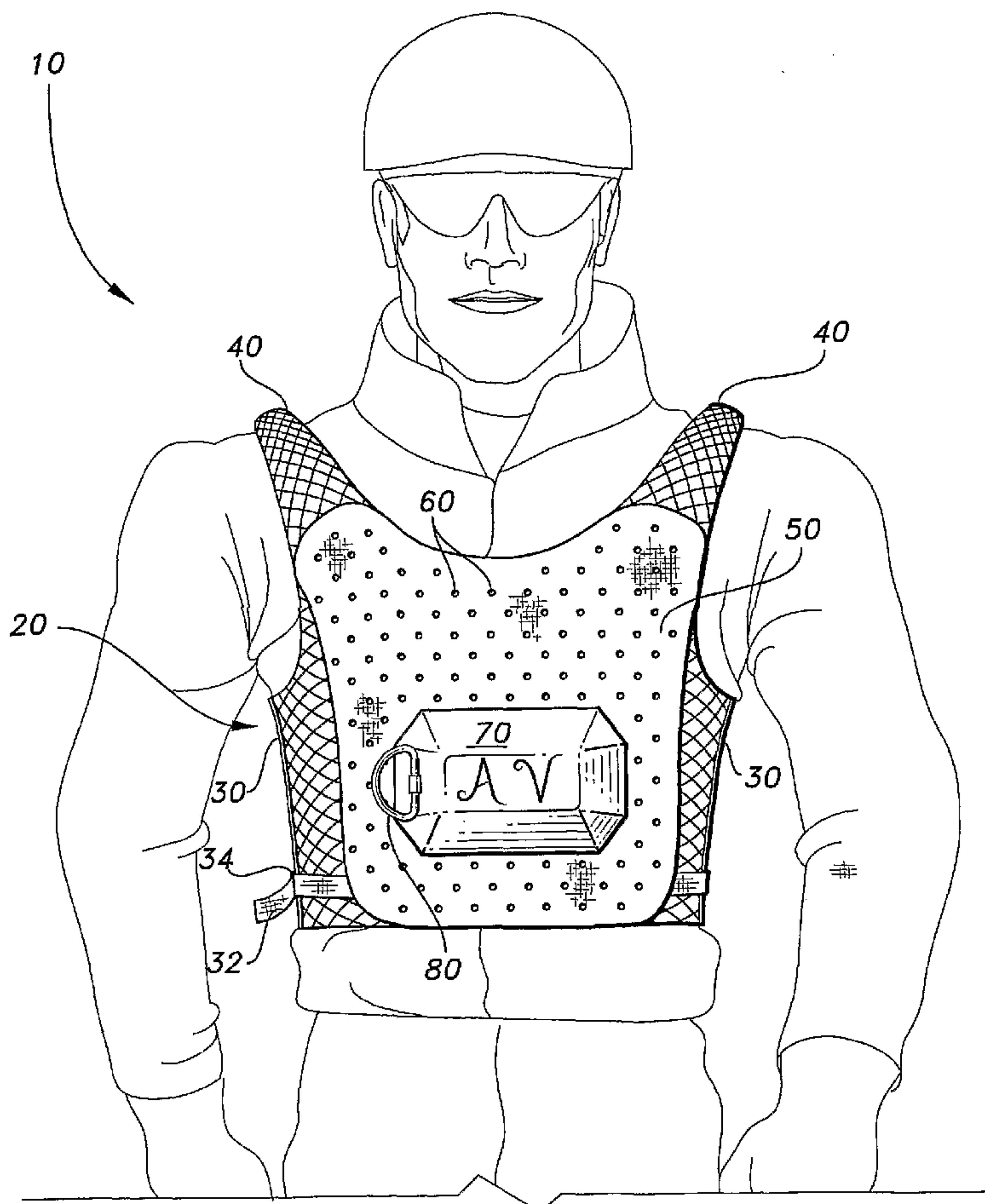
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(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: VEST WITH AIR BAG



(57) Abstract: A vest with air bag (20) includes a shell with shoulder pads (40), a front chest protector (50) having ventilation holes therethrough attached to the shell and an air bag (100) attached to the chest protector. The shell defines a neck opening, a torso opening, and a pair of opposed arm holes. The air bag (100) is configured to expand in front of a torso of a user. The vest includes a cartridge/canister (222), an activator (224), and a pull ring (80). The vest may include a power source (212), a sensor (214), a die marker (216), a positioning device (226), a communication device (228), an antenna (230), a control logic (210), and a communication bus (232). The pull ring (80) is configured to operatively engage the activator (224) to release breathable gas from the cartridge/canister (222) when the pull ring is pulled by a user.

WO 2004/107888 A1

WO 2004/107888 A1



Published:

- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

VEST WITH AIR BAG

TECHNICAL FIELD

The present invention relates to inflatable survival vests, and particularly to a vest with air bag that provides a protective safety measure for individuals in case of an avalanche.

5

BACKGROUND ART

One of the most serious dangers faced by skiers and snow aficionados is the occurrence of an avalanche. This disaster often occurs with no warning and with such speed that anyone caught in its path has little or no time to avoid it. Victims of an avalanche are frequently buried under many feet of snow, causing them to suffocate before any rescue personnel are able to reach them. The deadly effects of an avalanche are well known, making the need for survival equipment abundantly clear.

Avalanche survival equipment has been developed to address this deadly problem. U.S. Patent No. 6,220,909 B1, issued April 24, 2001 to Peter Aschauer et al., describes an avalanche survival apparatus having an inflatable balloon attached to a frame to which the user is harnessed. A release mechanism deploys the balloon by filling it with a compressed gas. Unfortunately, this avalanche survival apparatus suffers disadvantages. The avalanche survival apparatus is worn as a backpack and therefore creates a space in the snow behind the user when the balloon is deployed. Such a space it is not very helpful since it does not provide an air pocket and/or protection for the user's face nor does it provide room for the user to move his arms to dig out. The avalanche survival apparatus also does not provide protection for the user's arms and appears to be somewhat bulky making it unsuitable for smaller users.

U.S. Patent No. 6,270,386, issued August 7, 2001 to Ariel R.

Visocekas, describes an inflatable life jacket for use during an avalanche. The life jacket contains an air bag and a release system, which inflates the air bag. The release mechanism can be activated automatically, or manually by pulling a release handle. Once the air bag is deployed, it encompasses the
5 back and sides of the user's head, providing protection for that portion of the user. The air bag also serves as a buoyant force against the downward force of the avalanche and provides some breathable air. A hood or mesh is included to further shield the user from the elements. Unfortunately, this life jacket only deploys along the sides and back of the head. Although the user's
10 head and neck are protected, no space is created in front of the user, which would allow the user to move his arms for the purpose of digging out.

U.S. Patent No. 4,635,754, issued January 13, 1987 to Peter Aschauer et al., describes an avalanche rescue apparatus in the form of a frame worn on the user's back and a balloon which deploys from the frame.
15 The inflated balloon provides buoyancy during an avalanche thus keeping the user closer to the surface. Inflation of the balloon is achieved by pulling a ripcord, which punctures two gas bottles and releases gas into the balloon. This avalanche rescue apparatus suffers disadvantages in that it does not create space in the snow in front of the user and does not help the user keep
20 his arms in position to dig out of the snow.

U.S. Patent No. 4,365,628, issued December 28, 1982 to Carl F. Hodel, describes an avalanche survival vest designed to provide breathable air and added buoyancy during an avalanche. The vest, similar to the devices discussed above, does not help the user to dig out of the snow.
25 Rather, it only increases available rescue time.

World International Patent Organization (WIPO) Published Application No. WO 00/76589, published December 21, 2000, describes a survival jacket having an inflatable chamber. Gas bottles containing air or oxygen are held in pockets on the jacket and are discharged when the user
30 pulls on ripcords, thereby to inflate the jacket. Gas permeable patches allow the gas to escape, providing breathable gas for the user. Unfortunately, this survival jacket does not protect the user's arms during an

avalanche.

Other related art includes U.S. Patent No. 1,798,430, issued March 31, 1931 to Peter Markus (inflatable safety device), U.S. Patent No. 2,782,430, issued February 26, 1957 to Matthew I. Radnofsky (flotation and thermal protecting apparel), U.S. Patent No. 4,437,790, issued March 20, 1984 to Timothy N. Trap (buoyancy compensator), U.S. Patent No. 4,943,252, issued July 24, 1990 (avalanche flotation ball), and WIPO Published Application No. WO 01/08114 A2, published February 1, 2001 (avalanche safety vest).

As will be appreciated, a vest with air bag solving the aforementioned problems is desired. It is therefore an object of the present invention to provide a novel vest with air bag.

DISCLOSURE OF THE INVENTION

The present invention relates to a vest with air bag. The vest includes a shell defining a neck opening, a torso opening, and a pair of opposed arm holes. The vest also has a chest protector attached to the shell and an air bag attached to the chest protector. The air bag is configured to expand in front of a torso of a user.

In one embodiment, the vest includes a cartridge/canister, an activator, and a release in the form of a D-shaped pull ring. The vest may include a power source, a sensor, a die marker, a positioning device, a communication device, an antenna, control logic, and a communication bus. The pull ring is configured to operatively engage the activator to release breathable gas from the cartridge/canister into the air bag when the pull ring is pulled by a user.

The sensor is configured to compare a level of a monitored parameter with a reference signal and to effect automatic deployment of the air bag when the monitored parameter level of the sensor equals or exceeds the reference signal by causing the activator to release breathable air from the cartridge/canister into the air bag. The sensor may be a temperature sensor, a water sensor, a contact sensor, a motion sensor, an infrared

sensor, an acoustic sensor, an acceleration sensor, a hydrometer sensor, a sonic sensor, and/or a wind-speed sensor. The control logic may be firmware or may be configured as a microprocessor or a micro-controller.

5 The positioning device is configured to transmit a position signal regarding position data of the positioning device via a wireless communication link to determine the location of the positioning device or coordinate values of the positioning device relative to a predetermined reference point.

The communication device is configured to transmit and/or receive voice or data information via a wireless communication link. The communication device may be a cellular telephone, a personal digital assistant (PDA), a pager, a walkie talkie, a wireless Internet access device, a transponder, etc.

Accordingly, it is a principal aspect of the present invention to provide a vest with air bag, comprising:

15 a shell defining a neck opening, a torso opening, and a pair of opposed arm holes;
a chest protector attached to said shell;
an air bag attached to said chest protector; and
a pair of handles, the handles being located on opposite sides
20 of said air bag and positioned so that a user of said vest may grip said handles when said air bag is expanded in front of a torso of the user.

It is another aspect of the present invention to provide a vest with air bag including a cartridge/canister, an activator, and a pull ring. The vest may include a power source, a sensor, a die marker, a positioning
25 device, a communication device, an antenna, control logic, and a communication bus. The pull ring is configured to operatively engage the activator to release breathable gas from the cartridge/canister when the pull ring is pulled by a user.

It is yet another aspect of the present invention to provide
30 improved elements and arrangements thereof in a vest with air bag for the purposes described which is inexpensive, dependable and fully effective in accomplishing its intended purposes.

These and other aspects of the present invention will become

readily apparent upon further review of the following specification and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

5 Fig. 1 is an environmental, front view of an avalanche survival vest with air bag according to the present invention;

Fig. 2 is an environmental, side perspective view of an avalanche survival vest with air bag, showing the air bag in a deployed position;

10 Fig. 3 is a rear view of the avalanche survival vest with air bag;

Fig. 4 is a block diagram of the avalanche survival vest with air bag; and

15 Fig. 5 is a fragmented sectional view of the chest protector of the avalanche survival vest with air bag showing the different layers of material comprising the chest protector portion of the safety vest.

Similar reference characters denote corresponding features consistently throughout the attached drawings.

BEST MODE FOR CARRYING OUT THE INVENTION

20 The present invention relates to an avalanche survival vest with air bag. The invention disclosed herein is, of course, susceptible of embodiment in many different forms. Shown in the drawings and described herein below in detail is an embodiment of the present invention. It is to be understood, however, that the present disclosure is an exemplification of the
25 principles of the invention and does not limit the invention to the illustrated embodiment.

An avalanche survival vest with air bag is designated generally as 20 in the drawings. The avalanche survival vest 20 is designed to help a
30 wearer 10 survive an avalanche by creating a buoyant force, which keeps the wearer closer to the surface of the snow during an avalanche, and which forms an air pocket by displacing the snow in front of the wearer and releasing breathable air into that space.

Referring to the drawings, Figs. 1 to 5 illustrate the avalanche survival vest with air bag 20. The avalanche survival vest 20 includes side tensioning strips 30 on either side of the vest 20, for joining the front and rear portions of the vest 20. The tensioning strips 30 create a tight, but
5 comfortable fit for the wearer. A strap 32 with a fastener 34 is attached to the waist area of the vest 20, which further secures the vest 20 to the wearer. The vest 20 also includes shoulder pads 40, and a front chest protector 50 with ventilation holes 60.

An air bag housing 70 is fixedly mounted on the chest protector
10 50, and contains a deployable air bag 100. The air bag 100 may be manually deployed by pulling or manipulating a D-shaped pull ring 80 disposed, as shown, on the right side of the air bag housing 70, from the wearer's perspective 10. The pull ring 80 may obviously be disposed on a side other than the right side as desired (e.g., left side, top side, bottom side, etc.). The
15 pull ring 80 operatively engages an activator 224 (see Fig. 4) to release breathable gas held in a cartridge/canister 222 into the air bag 100. Once deployed, the air bag 100 expands away from and to the front of the face or chest of the wearer 10.

Fig. 2 shows the air bag 100 in a deployed position. The
20 deployed air bag 100 includes two strap handles 110, one on each side of the air bag 100, for the wearer 10 to grip after deployment. Gripping the strap handles 110 during an avalanche keeps the wearer's arms in a more stable position by preventing them from flailing about. Gripping the strap handles 110 also helps to stabilize the air bag 100 and keeps the wearer's arms in a
25 position to dig out of the snow. After deployment, the air bag 100 gradually deflates, releasing breathable gas into the cavity in the snow formed by the air bag 100.

The vest 20 is made from a durable, flexible sheet of mesh material, such as but not limited to nylon, canvas, polyester or an equivalent
30 material known to those of skill in the art, which encompasses the wearer's torso and forms a support to which the chest protector 50 is attached. Fig. 3 shows a rear view of the avalanche survival vest 20 and illustrates how the

5 durable mesh material covers the back and shoulder areas.

Fig. 4 illustrates a block diagram 200 of features incorporated into the avalanche survival vest 20 in this embodiment. Such features include control logic 210, a power source 212, a sensor 214, a die marker 216, a
5 sound generator 218, a radio device 220, the cartridge/canister 222, the activator 224, a positioning device 226, a communication device 228, an antenna 230, a communication bus 232, etc.

The control logic 210 may be firmware or may be configured as a microprocessor, a micro-controller, etc. The power source 212 may be any
10 desired power source, such as for example chargeable or non-rechargeable batteries, or the like. The sensor 214 may be any type of sensor for monitoring a particular parameter, such as acceleration, temperature, wind speed, water, etc. For example, sensor 214 may be a temperature sensor, a water sensor, a contact sensor, a motion sensor, an infrared sensor, an
15 acoustic sensor, an acceleration sensor, a hydrometer sensor, a sonic sensor, a wind-speed sensor, or the like. The sensor 214 may be connected to conventional circuitry (not shown) that compares the level of the monitored parameter with a reference signal. When the monitored parameter level equals or exceeds the reference signal, the circuitry may output a signal,
20 which may be either analog or digital in form, to activate the activator 224.

The die marker 216 is material that may be used by the wearer
10 to assist in his/her own rescue operation. In a similar manner, the avalanche survival vest 20 may include signal flares (not shown) to enable the wearer 10 to assist in his/her own rescue operation.

25 The sound generator 218 includes sound generator circuitry configured to emit a synthetic sound, such as a siren, a bell, a buzzer, etc., at a predetermined decibel level. The radio device 220 includes radio receiver circuitry, a tuning display, and radio controls. The radio controls include controls for power, tuning, and volume. Optional radio controls may include
30 station search, station seek, and stereo balance. The radio device 220 is configured to transmit and/or receive information and data, e.g., news,

weather, alphanumeric or voice commands, or any data stream, over a predetermined frequency range, e.g., shortwave, VHS, UHS, etc.

The positioning device 226 may include any type of transmitter or transceiver configured to transmit a position signal or beacon regarding position data of the positioning device 226 via a wireless communication link having a predetermined maximum signal strength enabling signal reception by an appropriately configured receiving device. The positioning device 226 may also utilize any type or combination of terrestrial, satellite, cellular technology, and/or any components (e.g., digital or analog, the Global Positioning System (GPS), the Iridium system, cellular telephones, pagers, paging chips, etc.), and be configured to transmit and/or receive position data regarding the positioning device 226 via a wireless communication link and determine the location of the positioning device 226 or coordinate values of the positioning device 226 relative to a predetermined reference point. These elements may all be interconnected via any type of communication bus 230.

The communication device 228 includes communication circuitry and is configured to transmit and/or receive voice or data information via a wireless communication link. The communication device 228 may be a cellular telephone, a PDA, a pager, a walkie talkie, a wireless Internet access device, a transponder, etc. The communication device 228 may all be interconnected via any type of communication bus 230.

The air bag 100 is inflated by manual and/or automatic activation of the activator 224, which releases pressurized, breathable gas from the cartridge/canister 222 into the air bag 100. The deployed air bag 100 provides breathable air to the wearer who becomes buried under snow. The air bag 100 forms an air pocket by displacing the snow in front of the wearer, and then the slightly porous air bag 100 gradually deflates, releasing breathable gas into the air pocket. The air bag 100 also serves as a buoyant force during an avalanche, keeping the wearer closer to the surface of the avalanche.

Manual activation of the air bag 100 occurs when the pull ring 80 is pulled by the wearer. When pulled, the pull ring 80 operatively engages

the activator 224 to release breathable gas from the cartridge/canister 222 into the air bag 100. Automatic activation of the air bag 100 occurs when the monitored parameter level of the sensor 214 equals or exceeds a reference signal. In this case, a signal is generated causing the activator 224 to release
5 breathable air from the cartridge/canister 222 into the air bag 100.

Fig. 5 shows a cross-sectional view of the chest protector 50. The outermost layer 140 of the chest protector 50 comprises a fabric covering, which may be any appropriate material, such as cotton, nylon, polyester, rayon, latex, spandex or a blend of these materials. The
10 intermediate layer 150 comprises a foam material or equivalent that is approximately 1/8" thick. The intermediate foam layer 150 is disposed on either side of a central layer 160 of flexible plastic or equivalent material that is approximately 1/8" thick. These layers of material are bonded together through ordinary bonding processes to form a cohesive protective chest pad
15 50 with ventilation holes 60 distributed throughout.

As illustrated, the avalanche survival vest 20 is worn as a pullover vest. Alternatively, the avalanche survival vest 20 may be opened and closed on one side to allow the wearer to don the avalanche survival vest 20 by opening the avalanche survival vest 20 and then sliding his/her arms
20 through the arm holes. According to such an example, the avalanche survival vest 20 would have closure element(s) in the front or in the back, such as fasteners, zippers, buttons, or snap hooks.

While the present invention has been described with reference to the illustrated embodiment, it will be understood by those skilled in the art
25 that various changes may be made and equivalents may be substituted for elements thereof without departing from the true spirit and scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teaching of the invention without departing from its essential teachings.

WHAT IS CLAIMED IS:

1. A vest with air bag, comprising:
a shell defining a neck opening, a torso opening, and a pair of
5 opposed arm holes;
a chest protector attached to said shell;
an air bag attached to said chest protector; and
a pair of handles, the handles being located on opposite sides
of said air bag and positioned so that a user of said vest may grip said handles
10 when said air bag is expanded in front of a torso of the user.
2. The vest with air bag according to claim 1 wherein said air bag
is manually deployable.
- 15 3. The vest with air bag according to claim 1 wherein said air bag
is automatically deployable.
4. The vest with air bag according to claim 1 wherein said air bag
is manually and automatically deployable.
20
5. The vest with air bag according to claim 2 or 4, further
comprising a pull ring, a cartridge/canister, and an activator, said pull ring
being configured to operatively engage the activator to release breathable gas
from the cartridge/canister when the pull ring is pulled by a user.
25
6. The vest with air bag according to claim 3 or 4, further
comprising a sensor, a cartridge/canister, and an activator, said sensor being
configured to compare a level of a monitored parameter with a reference
signal and to effect automatic deployment of the air bag when the monitored
30 parameter level of the sensor equals or exceeds the reference signal by
conditioning the activator to release breathable air from the cartridge/canister
into the air bag.

7. The vest with air bag according to any one of claims 2 to 6, further comprising control logic and a communication bus.

5 8. The vest with air bag according to claim 7, wherein said control logic is firmware.

9. The vest with air bag according to claim 7, wherein said control logic is a microprocessor or a micro-controller.

10

10. The vest with air bag according to any one of claims 7 to 9, further comprising a power source.

11. The vest with air bag according to claim 1 further comprising
15 control logic and a communication bus.

12. The vest with air bag according to claim 11, wherein said control logic is firmware.

20 13. The vest with air bag according to claim 12, wherein said control logic is a microprocessor or a micro-controller.

14. The vest with air bag according claim 13, further comprising a power source.

25

15. The vest with air bag according to any one of claims 11 to 14, further comprising a sensor configured to compare a level of a monitored parameter with a reference signal.

30 16. The vest with air bag according to claim 15, wherein said sensor is selected from the group consisting of a temperature sensor, a water sensor, a contact sensor, a motion sensor, an infrared sensor, an acoustic

sensor, an acceleration sensor, a hydrometer sensor, a sonic sensor, and a wind-speed sensor.

17. The vest with air bag according to any one of claims 1 to 16,
5 further comprising a die marker.

18. The vest with air bag according to any one of claims 1 to 4,
further comprising a cartridge/canister.

10 19. The vest with air bag according to any one of claims 1 to 4 and
18 further comprising an activator.

20. The vest with air bag according to any one of claims 1 to 19,
further comprising a positioning device and an antenna.

15

21. The vest with air bag according to claim 20, wherein said
positioning device is configured to transmit/receive a position signal regarding
position data of the positioning device via a wireless communication link and
determine the location of the positioning device or coordinate values of the
20 positioning device relative to a predetermined reference point.

22. The vest with air bag according to claim 21, wherein said
positioning device includes a combination of terrestrial, satellite, and cellular
technology components.

25

23. The vest with air bag according to any one of claims 1 to 19,
further comprising a communication device and an antenna.

24. The vest with air bag according to claim 23, wherein said
30 communication device is configured to transmit/receive voice or data
information via a wireless communication link.

25. The vest with air bag according to claim 24, wherein said communication device is a cell phone, a personal digital assistant (PDA), a pager, a walkie talkie, a wireless Internet access device, or a transponder.

5 26. The vest with air bag according to any one of claims 1 to 4, further comprising a power source, a sensor, a die marker, a cartridge/canister, an activator, a positioning device, a communication device, and an antenna.

10 27. The vest with air bag according to any one of claims 1 to 26, wherein said shell is made of a durable, flexible sheet of mesh material.

28. The vest with air bag according to any one of claims 1 to 27 wherein said chest protector includes ventilation holes.

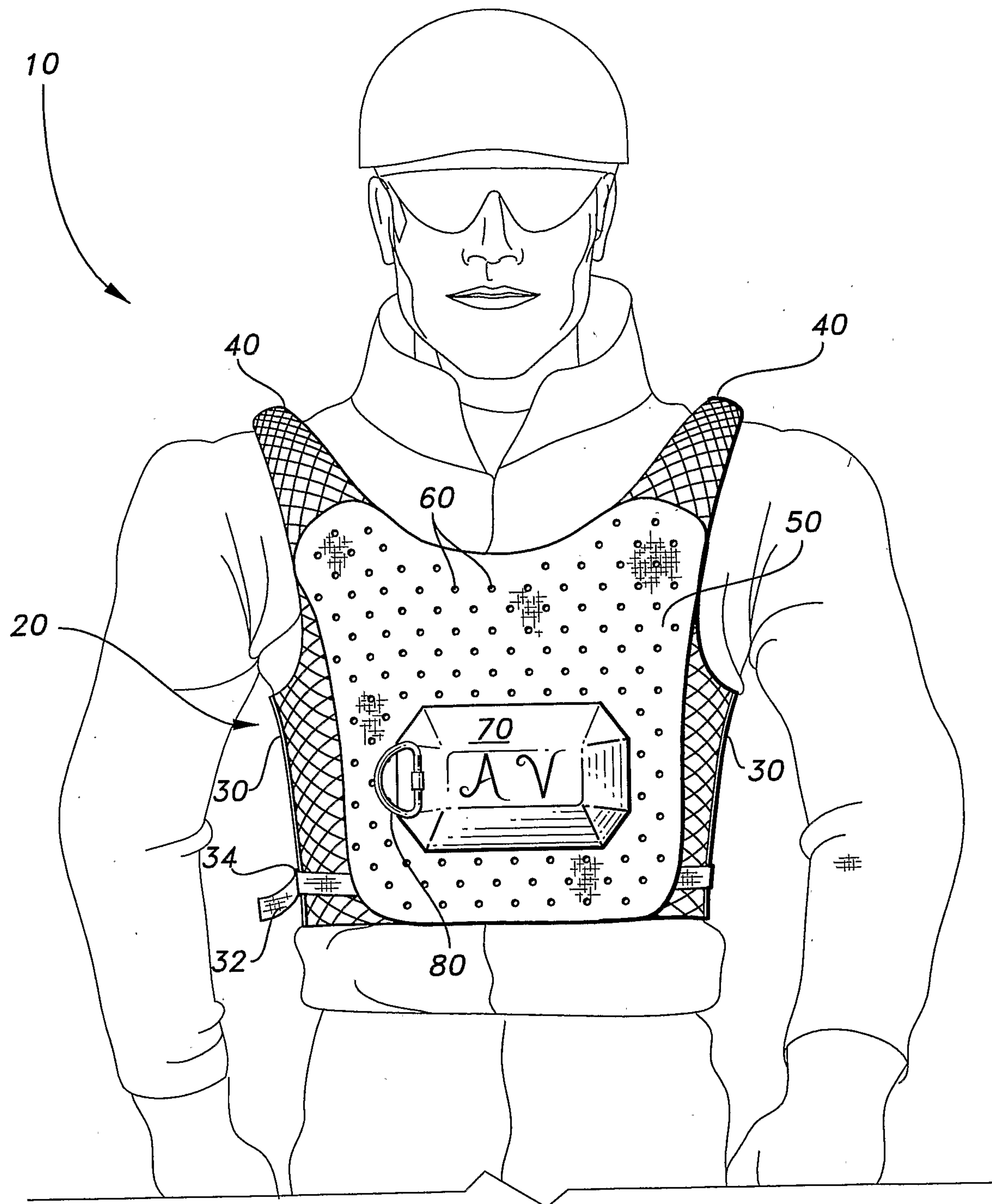
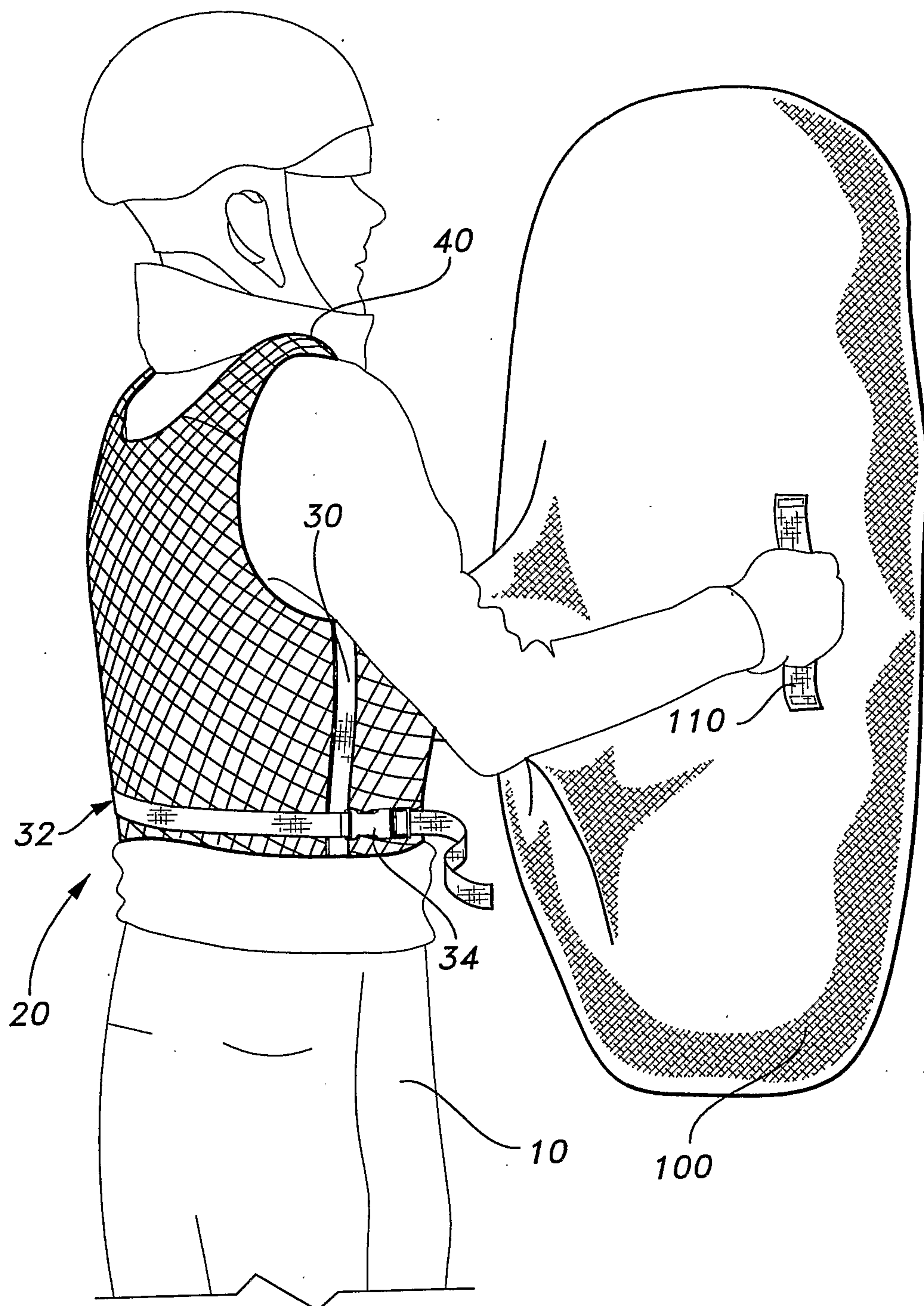
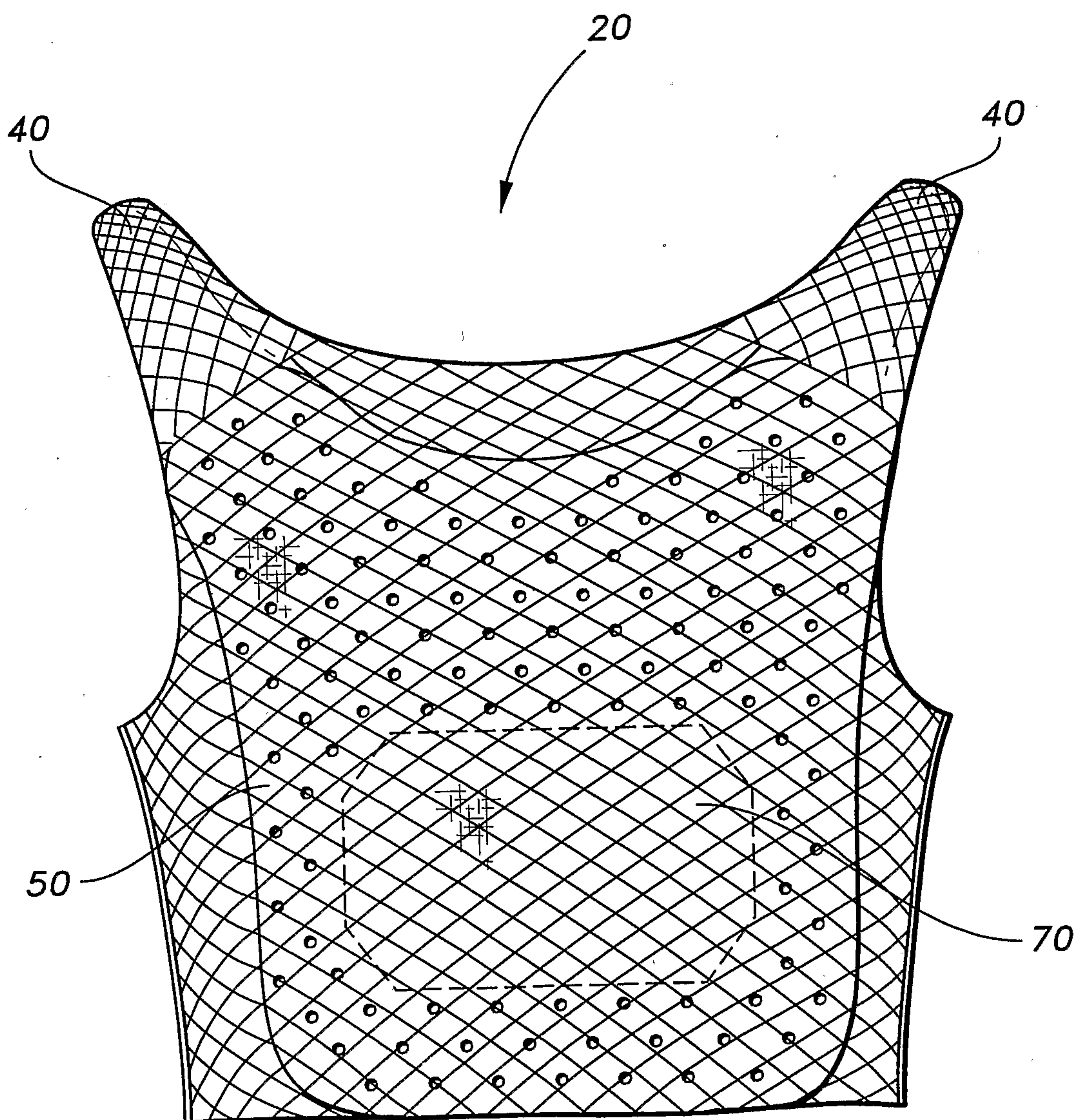


Fig. 1

*Fig. 2*

***Fig. 3***

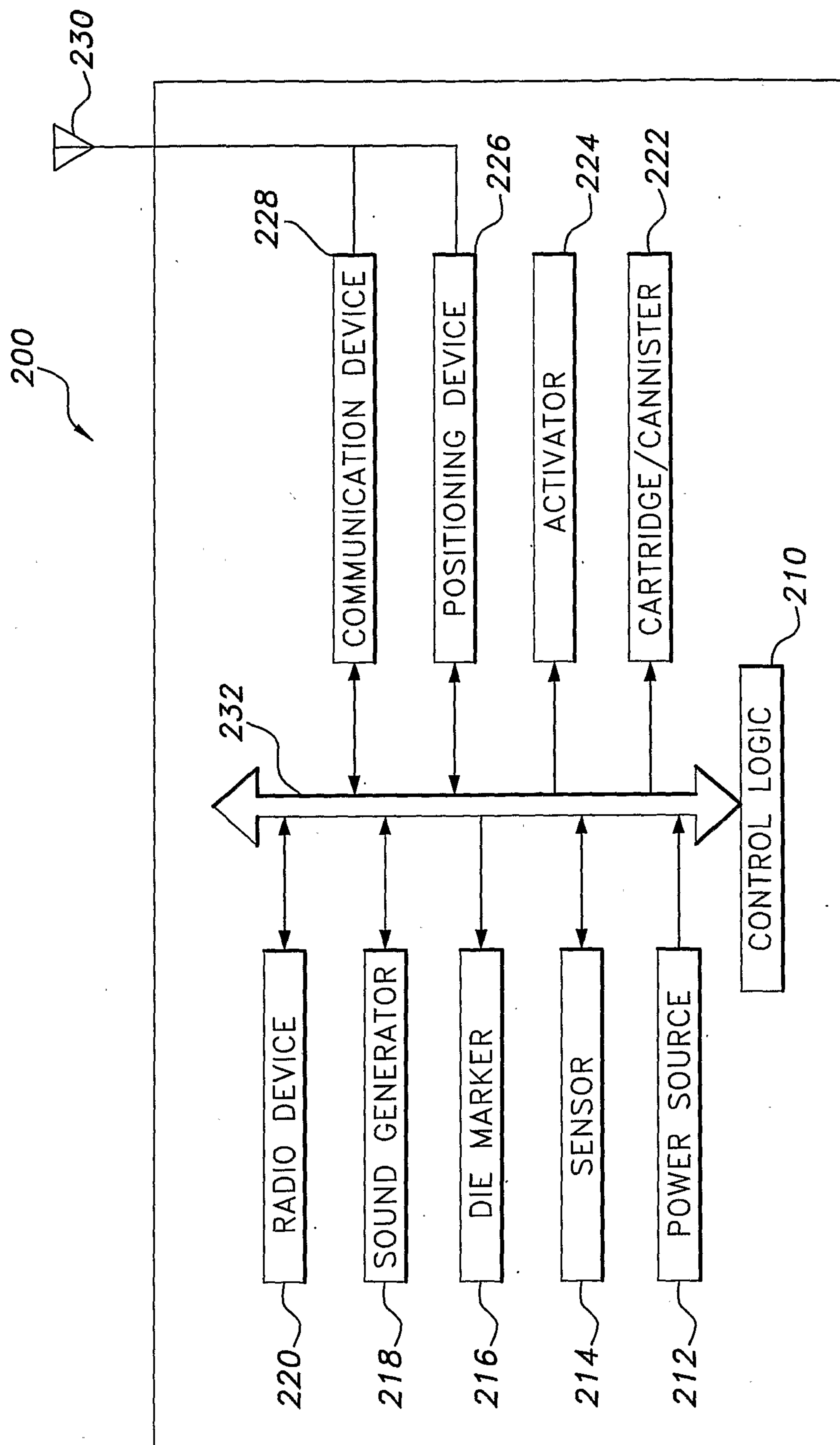
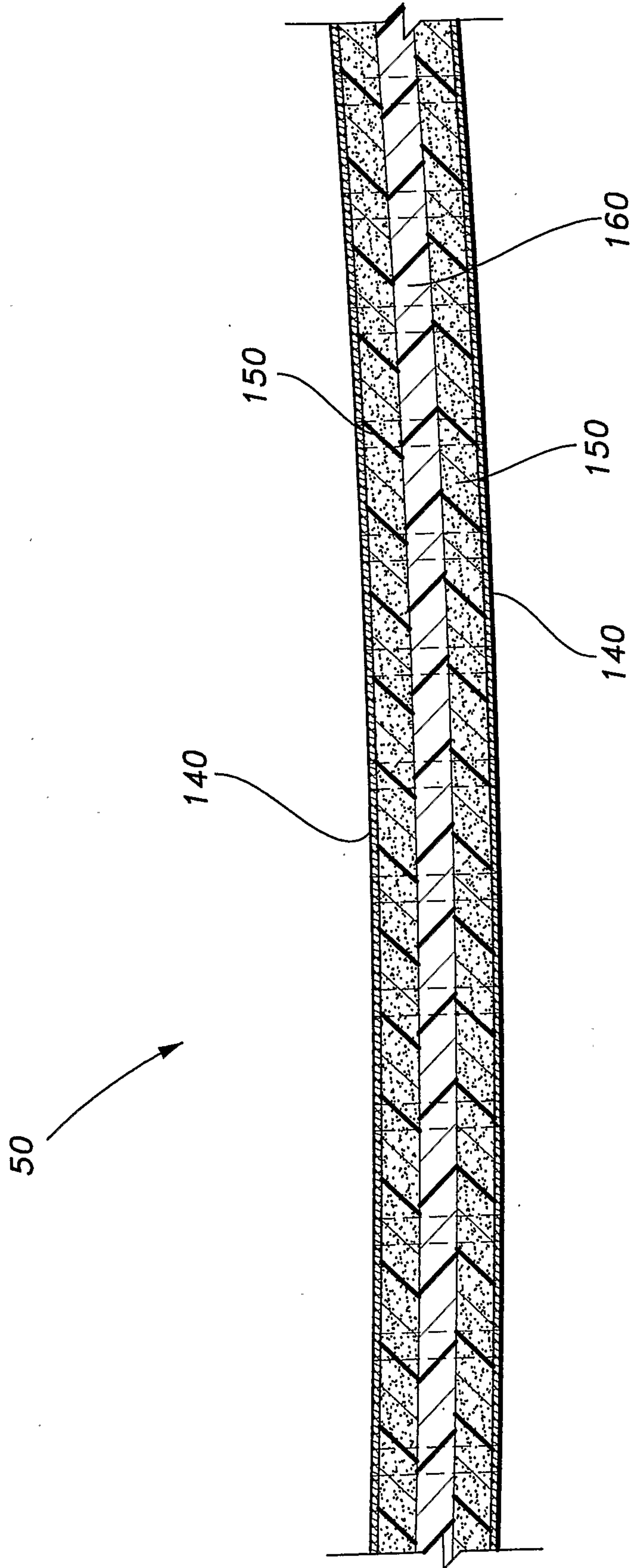


Fig. 4

*Fig. 5*

